DOCUMENT RESUME

ED 089 625 HE 005 370

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TITLE PSI Two Semesters Later.
PUB DATE Jul 73
NOTE 37p.

EDRS PRICE MF-$0.75 HC-$1.85 PLUS POSTAGE
DESCRIPTORS *Biology; Community Colleges; *Course Descriptions; *Course Evaluation; *Higher Education; Individualized Instruction; *Teaching Methods
IDENTIFIERS North Country Community College; *Personalized System of Instruction; PSI

ABSTRACT

Biology 101 was offered for the second time in the Personalized System of Instruction (PSI) format during the spring 1973 semester at North Country Community College. Course policy and procedure for the second semester were identical to fall 1972 except for policy changes outlined in Appendix C of that paper. Sixty students enrolled in the 1973 course, including five who withdrew from the 1972 course. An attempt is made here to identify shifts in student performance during 1973 in an effort to validate policy changes made at the close of 1972 and to identify additional changes that should be initiated. Well over 10% changes in course materials were made at the close of the 1972 semester. The 1973 students generally showed improved pacing over first semester students. The tables in this report contain: the comparison of grade-point averages (GPA) of biology 101 students; the average progress rate of 1972 and 1973 biology 101 students; average daily attendance in biology 101; relative laboratory grade earned compared with nonlaboratory grade; and eventual placement of 1972 biology 101 students. Appendices include course prerequisites, and the time extension policy. (Author/PG)

ED 089625

PSI TWO SEMESTERS LATER

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July 1973

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EDUCATION & WELFARE
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INTRODUCTION

Biology 101 was offered for the second time on the PSI format during the spring 1973 semester (S73). The course was offered from 8:30-9:50 A.M., Monday, Wednesday, Thursday, and Friday. Course policy and procedure for the second semester were identical to fall 1972 (F72) as described in PSI ONE SEMESTER LATER, except for policy changes outlined in Appendix C of that paper.

Sixty students enrolled in the S73 course, including five who withdrew during F72. An attempt is made here to identify shifts in student performance during S73 in an effort to validate policy changes made at the close of F72 and to identify additional changes which should be initiated.

Well over 100 changes in course materials were made at the close of the F72 semester. Many changes were minor in nature, others included writing unit appendices to clarify troublesome concepts. One of the greatest satisfactions during S73 came from observing students master previous hurdles with greater ease as a result of material modifications.

The materials were again revised at the end of the S73 semester, and are currently being retyped in a more permanent, mimeographed form.

RESULTS AND DISCUSSION

S73 students generally showed improved pacing over first semester students (see Figure 1). For the sake of more specific comparison with F72 data, the sixty S73 students are divided into three groups. By the end of the semester, 33 (55%) COMPLETERS took the final examination, 11 (18%) were IN-PROGRESS, and 16 (27%) withdrew (WITHDRAWALS) from the course. Compared with F72, these figures represent a 15% increase in students completing the course, a 3% decrease of in-progress students, and a 12% decrease in withdrawals. This shift in end of semester student placement is illustrated in Figure 2. Grade point averages (GPA) for the three groups for F72 and S73 appear in Table 1.

Completers

Figure 3 illustrates average progress rates of F72 and S73 completers. In contrast to F72, S73 students exhibit no lag period, essentially pacing on the red line, except for several weeks following spring vacation (April 16-23, i.e., beginning week 11). At worst (week 12) S73 completers were only a fraction (0.7) unit) of one unit below the red line. By contrast F72 completers were 1 unit behind by the 4th week of the semester and from weeks 5 through 13 were behind from 1.7 to 2.5 units, recovering only during the last two weeks of the semester.

In contrast to the fall semester in which only 2 students took an early final examination, 7 S73 students completed the course early.

Four (12%) completers (equal number as F72) did not meet course prerequisites (see Appendix A for course prerequisites). Each lacked the requisite science background and one had no high school algebra. No completer took developmental courses concurrently.

Sixty-four percent (21 students) of the completers had all four biology class periods free, and 36% (12 students) were able to complete the course with only three class periods free, having scheduled another course into one of the biology time periods.

Included among S73 completers was one F72 withdrawee.

In-Progress

In-progress students from both F72 and S73 completed an average of 13 units. However, progress of S73 students (Figure 4) was considerably more uniform than that of F72 in-progress students. S73 progress was essentially linear through week 11. The slight decrease in S73 progress during the remaining weeks of the semester (students were aware of the availability of a time extension) contrasts with an increased rate of progress for the same time period during F72 (students operating under an end of the semester doom's day assumption in which non-completers would receive NC).

Several observations about in-progress students: 1) Seven (64%) students did not meet course prerequisites (the same number as F72). Six of these had inadequate high school science backgrounds, 3 had no high school algebra (2 of these also had inadequate science backgrounds), 1 took Basic English (DEV 001) concurrently (in addition to having inadequate high school science and no high school algebra).

Eight of the 11 S73 in-progress students registered to complete the course during the first summer session of 1973 (June 4-July 6). The remaining three students chose to complete the course during the fall 1973 semester. The validity of the new extension policy for in-progress students which becomes effective F73 (see Appendix B) receives support from the performance of the eight in-progress summary students, all of

which completed the course during that time. Six students completed during the first two weeks of summer session, and only two continued through to the end of the fifth week of summer session. No student carried any other courses concurrently and so was free to concentrate on biology. It will be of interest to observe the fate of the three students who chose to complete the course during the fall 1973 semester.

Sixty-four percent (7 students) of in-progress students had all four biology periods free in their schedules. An additional 27% (3 students) had only three periods free, and 9% (1 student) kept only two periods open. It would seem that these students could least afford to schedule other courses into biology time slots. This group of students included one one withdrawee from F72.

Withdrawals

Twenty-seven percent (16 students) of the originally enrolled students withdrew from the course compared to 39% withdrawal for F72. The 12% decrease in withdrawal is encouraging. It would seem reasonable to expect that the new college policy on time extensions included in the course syllabus alleviated the pressure to withdraw which students with slower progress undoubtedly faced during F72.

Progress of withdrawing students is plotted in Figure 5. Be aware that the average number of units completed each week by withdrawing students is based on the number of students still remaining in the course as of that time; therefore points along the curve represent differing numbers of students. Students withdrawing during the first nine weeks of the semester were generally more advanced at the time of withdrawal than F72 students.

Eight students (50%) did not meet science prerequisites. Of these students, one also had no high school algebra and one took Basic English (DEV 001) concurrently. Two (13%) students scheduled another course

into one of the biology time periods.

The withdrawing student completed an average of 4 units (range 0-17). Only two of the 14 students that took tests (two students took no tests) did not pass the last test taken.

Cause of withdrawal is again not clear. However, it appears that at least five students withdrew for reasons that were not specifically course related. Of the remaining 11 students, two never came to class at all, (one of these also withdrew during F72), one completed only unit 0 (test on syllabus), one student withdrew after completing 17 units (he was receiving an NC in the laboratory portion of the course due to excessive absences (he did not need the credits for graduation), two other students were withdrawees from F72 (one after completing two units, the other after completing 9 units).

Grades

PSI grades for the second semester approximate roughly the inverted bell of the F72 semester, with the left side of the curve again disrupted by a relatively few number of A's (8%). See Figure 6. There was a 10% increase in B's and an 11% increase in C's. No D's were earned, a 4% decrease from F72. NC's decreased 13%, IP's diminished 3%.

An overview of grades in Biology 101 is presented in Figure 7 which compares lecture cumulatives (F70-S72) with PSI cumulatives (F72-S73).

Gain Scores

The concept of accountability has received increased attention in educational circles in recent years. The "G Statistic" ("G" symbolizing gain) is one of several means of measuring instructional effectiveness.

At the beginning of the course each student took a 100 point examination (pre-test) equal to the final examination in length, content, and difficulty. Each student also took a final examination (post-test)

at the completion of the course. A gain score was obtained for each student by calculating the ratio of actual gain made during the course, to the maximum gain possible for that student. The ratio was calculated as follows:

Example - A student scored a 20% on the pre-test and an 85% on the post-test.

$$G = \frac{\text{actual gain}}{\text{possible gain}} = \frac{\text{post-test} - \text{pre-test}}{\text{total} - \text{pre-test}} = \frac{85\% - 20\%}{100\% - 20\%} = .81$$

Reference to Appendix C indicates that a G of .81 ranks in the 98th percentile for programmed courses and the 99th percentile for non-programmed courses.

The mean gain for students was 0.44 which ranks at the 37th percentile for gains in programmed courses and in the 64th percentile for non-programmed courses.

Attention is being given to the significance of the G statistic as it is not as high as expected.

Attendance

The improved pacing of S73 students is also reflected in student attendance, shown in Figure 8. The relatively uniform weekly attendance during the first four weeks of S73 (likely due to the four week time contingency) compares with a generally decreasing attendance during the same time period of F72. While attendance dropped 10% during the next 2 weeks of S73, at no time did it fall below F72 levels until following spring vacation.

The crush of students in the classroom during the last several weeks of the semester did not materialize during S73 apparently for several reasons. Since students generally were not as far behind throughout S73 semester, there was less need for an end of semester sprint. Also,

students opting for the time extension (in-progress) likely sensed less need to push toward the end of the semester (see Figure 4, week 12 onward). Additionally, seven students had been eliminated from the classroom prior to the last week of the semester as a result of taking early final examinations.

Despite generally uniform weekly attendance, daily attendance oscillated considerably. Peak attendance typically occurred on Wednesday, with lowest attendance on Friday and Monday. Due to nearly unmanageable student loads on a number of Wednesdays, some attention will be given changing to a Monday through Thursday or Tuesday through Friday class schedule. Such a schedule modification should assist equalizing daily attendance by not subjecting the course to both a Monday and Friday 8:30 class.

Effects of Course Policy Changes

Course policy was modified to accommodate two major problems which developed during the F72 semester. Procrastination and withdrawal rate were both discussed extensively in PSI ONE SEMESTER LATER.

PROCRASTINATION: Appendix C of PSI ONE SEMESTER LATER describes a four week time contingency to be used for the first time during S73. The contingency was designed to aid students in getting an immediate start in the course. Ten students (17%) did not meet the contingency. This compares to 54% of the F72 students being behind at the same point in time.

The instructor spoke personally with each student who did not meet the deadline. Four of the ten students were experiencing real difficulty with the course, one had extended illness during the first month of the semester, and five students appeared to not have gotten into the course. Every student expressed a strong desire to remain in the course. In each case a new, mutually agreed upon, time contingency was set which

would insure that each student was on the red line within several weeks. Only two students met the contingency, and continued to complete the course by the end of the semester. While none of the remaining eight was asked to withdraw, two did so in the course of the semester. The six remaining students continued to plod, were in-progress at the end of the semester and all completed the course during the first summer session 73.

The effects of the four week contingency appear well illustrated in thestudent progress rates (Figures 1, 3, 4, 5). The effect is equally pronounced in attendance during the first four weeks of S73 as compared with F72 (Figure 8).

In addition to the time contingency other factors likely contributed to the over all improved pace of work throughout the semester: 1) Word spread to the S73 class from F72 students that, while the course involved considerable work, it was manageable if one paced properly. Indeed, the work to be done did not go away if one slipped behind. 2) Second semester students are perhaps a somewhat more serious group due to first semester attrition from the college, increased acclimation to college life, etc.

It is encouraging that the new college policy (Appendix D, PSI ONE SEMESTER LATER) opening the end of the semester for students requiring additional time to complete the course did not aggravate the procrastination problem. The mature treatment of the policy by students is also underscored by a 3% decrease of in-progress students over F72. (F72 students worked under an assumed end of semester doom's day.)

Withdrawal

While the withdrawal rate is still of concern, there is question as to whether it can be substantially reduced. S73 course policy clearly provided a start of semester nudge (four week contingency) and an end of semester time extension. These features plus extensive individual

attention to anyone desiring it tends to suggest that students withdrew primarily for a reason, or composite of reasons, beyond the control of the course, e.g., lack of interest in biology, course requires too much work, PSI is not suited to cognitive style of student, personal problems, etcetera.

Laboratory

One of the most difficult aspects of the course to accept during the past two semesters is the marked disparity between student performance in the PSI and laboratory portions of the course. The laboratory is conducted in a traditional, lock-step manner. The disparity is well illustrated in Figure 9. In the past two semesters 31% of the students earned D's in the laboratory while only 4% earned D's in the PSI portion of the course. Twenty-three percent of the students earned C's in the laboratory as opposed to 16% in the PSI part of the course. Correspondingly, students earned comparatively fewer A's and B's in the laboratory. Laboratory performance during the past two semesters bears striking resemblance to performance in the lecture portion of the course from fall 1970 through spring 1972 (Figure 7).

Figure 10 expresses the data in a somewhat different manner. Here laboratory performance is expressed on the basis of the percentage of students passing the course who scored higher, the same, or lower in the laboratory as compared to the non-laboratory portion of the course. The graph includes information covering the period when the non-laboratory portion of the course was conducted on lecture (F70-S72) as well as PSI (F72-S73) format. The graph requires little comment, for it clearly reveals the dramatic decrease in relative quality of laboratory work during the last two semesters. (The term "relative quality" is used since the shift in grades is due primarily to improved quality of work in the non-laboratory portion of the course (PSI) beginning in the fall of 1972,

EVALUATION

One week prior to the end of the S73 semester students again completed an extensive, anonymous evaluation of PSI. The questionnaire was identical to that used during the F72 semester. Sample size for S73 was 41.

The attached copies of the questionnaire include data from both F72 and S73. F72 figures appear to the left of each item and S73 figures appear to the right. S73 responses are similar to those from F72. Written responses to questions 28 to 33 and question 70 are not included in this report.

BIOLOGY 101 EVALUATION 1972-73

PERSONALIZED SYSTEM OF INSTRUCTION

This evaluation form is my primary source of information about your reactions to the introductory biology course you just completed. Since changes in the course structure will be based on your answers, it is very important to me that your responses are entirely honest. Please notice that this questionnaire is anonymous. I will greatly appreciate your cooperation in helping me design a better course.

I. General Course Evaluation

1. Are the objectives of the course clear?

	A	B	C	D	E
79%	90% 16%	7% 3%	2% 3%	0% 0%	0%
	CLEAR				UNCLEAR

2. Are the tests fair?

	A	B	C	D	E
76%	73% 21%	12% 3%	0% 0%	4% 0%	2%
	FAIR				UNFAIR

3. Are grades assigned fairly?

	A	B	C	D	E
63%	63% 37%	21% 0%	7% 0%	2% 0%	2%
	FAIR				UNFAIR

4. How would you rate the contribution of the textbook to the course?

	A	B	C	D	E
47%	36% 47%	43% 5%	7% 0%	2% 0%	0%
	EXCELLENT				POOR

5. Considering that the "lecture" portion of this course carries three credits, I think the amount of work required for the "lecture" portion of the course (PSI portion) is:
   A. far too much
   B. too much
   C. about right
   D. too little
   E. far too little

6. In comparison with 3 credit lecture courses, I think that the amount of work required in the "lecture" portion of this course is:

18%	A. much greater	21%	3%	D. less	0%
47%	B. greater	46%	8%	E. much less	0%
24%	C. about the same	29%			

7. In comparison with lecture courses, the degree of pressure on me to do the work of this course was:

8%	A. much greater	14%	21%	D. less	17%
58%	B. greater	53%	3%	E. much less	4%
8%	C. about the same	9%	3%	Other	

8. In comparison with lecture courses you have taken, rank the difficulty of this course.

13%	A. much more difficult	9%	13%	D. less difficult	19%
39%	B. more difficult	29%	5%	E. much less difficult	4%
29%	C. about the same	31%			

9. In comparison with lecture courses, the percentage of my mastery of the material in this course was:

31% A. much greater 41%
44% B. greater 34%
16% C. about the same 17%
9% D. less 7%
0% E. much less 0%

10. In comparison with lecture courses, the feeling of achievement generated by passing tests in this course was:

38% A. much greater 34%
38% B. greater 53%
19% C. about the same 7%
5% D. less 7%
0% E. much less 0%

11. In comparison with lecture courses generally, my enjoyment of this course was:

21% A. much greater 19%
47% B. greater 51%
21% C. about the same 21%
8% D. less 4%
3% E. much less 4%

12. In comparison with lecture courses generally, the frequency of cheating in this course was:

0% A. much greater 0%
0% B. greater 0%
15% C. about the same 9%
29% D. less 21%
55% E. much less 58%

13. In comparison with lecture courses generally, my temptation to cheat was:

3% A. much greater 0%
3% B. greater 7%
33% C. about the same 14%
25% D. less 19%
36% E. much less 51%

14. In comparison with other courses generally, my understanding of basic concepts and principles in this course was:

27% A. much greater 29%
57% B. greater 39%
16% C. about the same 21%
0% D. less 7%
0% E. much less 2%

15. In comparison with lecture courses generally, my tendency to memorize details in this course was:

14% A. much greater 21%
49% B. greater 46%
32% C. about the same 26%
5% D. less 7%
0% E. much less 0%

16. In comparison with lecture courses generally, the influence of the instructor on me in this course was:

11% A. much greater 41%
51% B. greater 34%
19% C. about the same 14%
19% D. less 9%
0% E. much less 0%

17. In comparison with lecture courses generally, the recognition of me as an individual in this course was:

19% A. much greater 29%
57% B. greater 34%
19% C. about the same 29%
5% D. less 7%
0% E. much less 0%

18. As the term went on, I found that my study habits in this course were:

19%	A.	greatly improved	31%	8%	D. harmed 9%
54%	B.	improved	43%	3%	E. greatly harmed 2%
16%	C.	unaffected	12%		

19. As the term went on, confidence in my ability to master the units:

14%	A.	increased greatly	21%		D. decreased 12%
65%	B.	increased	48%		E. decreased greatly 0%
16%	C.	was unchanged	14%		

20. The size of the units in this course was:

3%	A.	much too great	0%	0%	D. too small 2%
16%	B.	too great	7%	0%	E. much too small 0%
78%	C.	about right	82%		

21. As the term went on, my worry about my final standing in the course:

17%	A.	increased greatly	12%	19%	D. decreased 21%
42%	B.	increased	36%	3%	E. decreased greatly 2%
19%	C.	remained about the same	31%		

22. Of your total study time per week, approximately what percentage of this time do you devote to studying material in this course?

8%	A.	0-15% 0%		38%	D. 45-60% 34%
11%	B.	15-30% 12%		14%	E. more than 60% of the total 24% study time
27%	C.	30-45% 29%			

23. Under what conditions do you study?

59%	A.	in silence 73%
19%	B.	usually with a record player, or radio 17%
22%	C.	other 9%

24. Do you frequently study the course material with someone else?

83%	A.	no 75%	24%)	6%	D. yes, with 3 other persons 0%
17%	B.	yes, with 1 other person		0%	E. yes, with 4 other persons 0%
3%	C.	yes, with 2 other persons 0%			

25. Would you recommend this course to your good friends?

0%	A.	definitely not	4%	62%	D. yes 60%
11%	B.	maybe	4%	8%	E. no opinion 14%
19%	C.	probably	19%		

26. Would you recommend this type of instruction, i.e., PSI?

0%	A.	definitely not	2%	70%	D. yes 80%
11%	B.	maybe	9%	3%	E. no opinion 4%
16%	C.	probably	2%		

27. Rate your learning in this course against all other courses you have taken so far.

30%	A.	much greater	46%	5%	D. less 4%
54%	B.	greater	39%	0%	E. much less 0%
11%	C.	about the same	9%		

28. Specify what it is that made you learn in this course.

29. Specify what it is that interferred with your learning in this course.

30. What aspect(s) of this course did you especially like?

31. What aspect(s) of this course did you especially dislike?

32. If you could change one aspect of the course to improve it, what would you change?

33. General comments:

34. Considering all of the above qualities which are applicable, how would you rate this course?

46% A 46% 47% B 43% 3% C 9% 3% D 0% 0% E 2%

EXCELLENT VERY BAD

II. Proctor Evaluation

35. Did your proctor know the subject matter sufficiently well to do a good job of grading your tests?

46% A 60% 54% B 36% 0% C 2% 0% D 2% 0% E 0%

VERY KNOWLEDGEABLE INCOMPETENT

36. Did your proctor know the subject matter sufficiently well to provide adequate tutoring assistance?

46% A 51% 43% B 41% 11% C 4% 0% D 2% 0% E 0%

VERY KNOWLEDGEABLE INCOMPETENT

37. Was your proctor helpful when you had difficulty?

65% A 68% 35% B 26% 0% C 9% 0% D 0% 0% E 0%

ACTIVELY HELPFUL NOT HELPFUL

38. Did he appear sensitive to your feelings and problems?

49% A 63% 41% B 26% 8% C 4% 0% D 7% 3% E 0%

RESPONSIVE UNAWARE

39. Was he flexible?

36% A 41% 50% B 41% 11% C 17% 3% D 2% 0% E 0%
FLEXIBLE RIGID

40. Did he make you feel free to ask questions, disagree, express your ideas, etc.?

59% A 60% 30% B 29% 11% C 7% 0% D 4% 0% E 0%
ENCOURAGES STUDENT IDEAS INTOLERANT

41. Was he fair and impartial in his dealings with you?

73% A 65% 24% B 29% 3% C 2% 0% D 2% 0% E 0%
FAIR FAVORS SOME

42. Did he tell you when you had done particularly well?

83% A 80% 30% B 21% 3% C 0% 0% D 0% 0% E 0%
ALWAYS NEVER

43. Considering all of the above qualities which are applicable, how would you rate this proctor?

51% A 70% 46% B 21% 3% C 9% 0% D 0% 0% E 0%
EXCELLENT VERY BAD

III. Instructor Evaluation

IV. Miscellaneous

64. Your classification:

53% A. 1st semester 7% 0% D. 4th semester 17%
8% B. 2nd semester 63% 6% E. Part-time 2%
33% C. 3rd semester 7%

65. Your cumulative GPA: (Applies only if this is not your first semester.)

0% A. 4.0 0% 3% D. 1.00-1.99 7%
11% B. 3.00-3.99 31% 0% E. 0.00-0.99 0%
27% C. 2.00-2.99 58%

66. If this is your first semester at NCCC, how do you estimate your overall performance in all courses you are now taking?

4% A. A student 0% D. D student
64% B. B student 4% E. NC
28% C. C student

67. If you needed another science course and had the choice of taking that course with a PSI or lecture approach, would you choose PSI?

46% A. yes 51% B. probably yes 3% C. probably not 0% D. no 2%
73% 14% 9%

68. If you had the choice of taking a non-science course with a PSI or lecture approach, would you choose PSI?

35% A. yes 49% B. probably yes 34% C. probably not 3% D. no 9%
36% 36% 17%

69. How many units of this course did you complete? _____

70. If you did not complete all 20 units, would you like to suggest how the course could be run differently to prevent your falling behind (and still maintain self-pacing)?

FALL 1973 SEMESTER

For the first time, enrollment in Biology 101 will be increased to eighty students. PSI should be able to accommodate this number of students provided there are no spatial or proctor shortage problems. We face both. Due to a relatively small pool of eligible persons there has been difficulty obtaining an adequate number of proctors to handle 80 students. Additionally the course will be offered under restrictive space accommodations.

Course prerequisites have been relaxed slightly for F73 (Appendix D). Of the 19 students enrolled in the course during S73 that did not meet course prerequisites, 10 (53%) students completed the course either by the end of the semester (4 students) or by the end of the first summer session of 1973 (6 students). Further relaxation of prerequisites is pending finalization of a new developmental program at the college.

IN-PROGRESS STUDENTS FROM F72

A word must be said about the 12 F72 students who reregistered to complete the course during S73, taking up where they left off. Eight of these students finished the course during the second semester. Two of the remaining four students did not appear at all, one came to the classroom once, took and passed a test, and never returned. The fourth student did not come to class until the 10th week and thereafter appeared every other week. This student reregistered for the course a second time during the first summer session 1973 and completed the work. Figure 11 summarizes the eventual placement of F72 students. Fifty-six percent of the original class of 57 students passed the course (40% completers and 16% in-progress at the close of F72). Forty-four percent of the class received NC's (39% withdrawals and 5% in-progress at close of F72).

F72 in-progress students created several problems. 1) It was necessary to be prepared to handle them at the beginning of the semester, at a time when proctors were busy preparing to accommodate the 60 new students in the course. Despite elaborate plans to accommodate the IP's and a personal memo to each student five weeks into the semester reminding them that time was quickly slipping by, they did not appear in the classroom generally until toward the end of the semester. This also was not a convenient time for accommodating them. A look at these students' registration records provided a good explanation for their procrastination. Eight of these students carried overloads ranging from 17 to 22 credits. A self-pacing course does not compete well against such odds. Additionally only 3 students kept the 4 class periods scheduled for Biology 101 free in their spring schedules. Three students kept 3 class periods free, 3 retained 2, 2 students kept one class period free and one student kept none free.

Obviously, some cutting of other classes eventually occurred by IP's in order to complete the course. Despite the above logistical problems, the arrangement for handling in-progress students seemed educationally unsound in that most students spread the one semester course over 9 months with significant time spaces during which no attention was given to biology. Not only would the course almost unavoidably come apart with such treatment, students were faced with needing to reassemble the course in preparation for the final examination.

As a result of the problems described, an experimental solution for handling IP's was developed late in the S73 semester, for enactment in the F73 semester. The policy is outlined in Appendix B of this paper. While not yet in effect, the policy is already substantially validated by the results of S73 in progress students who continued the course during the first summer session of 1973.

TABLES

And

FIGURES

Table 1. Comparison of Grade Point Averages (GPA) of Biology 101 Students.

	GRADE POINT AVERAGE[1]			
	MEAN		RANGE	
	F72	S73	F72	S73
Withdrawals	2.00	1.96	0-4.00	0-3.00
In-Progress	2.45	2.36	1.83-3.34	1.50-3.31
Completer	3.07	2.80	1.74-4.00	2.00-3.83

[1]Cumulative GPA as of the close of F72 and S73 semesters. GPA does not include grade for Biology 101.

Figure 1. Average Progress Rate of Fall 1972 and Spring 1973 Biology 101 Students.

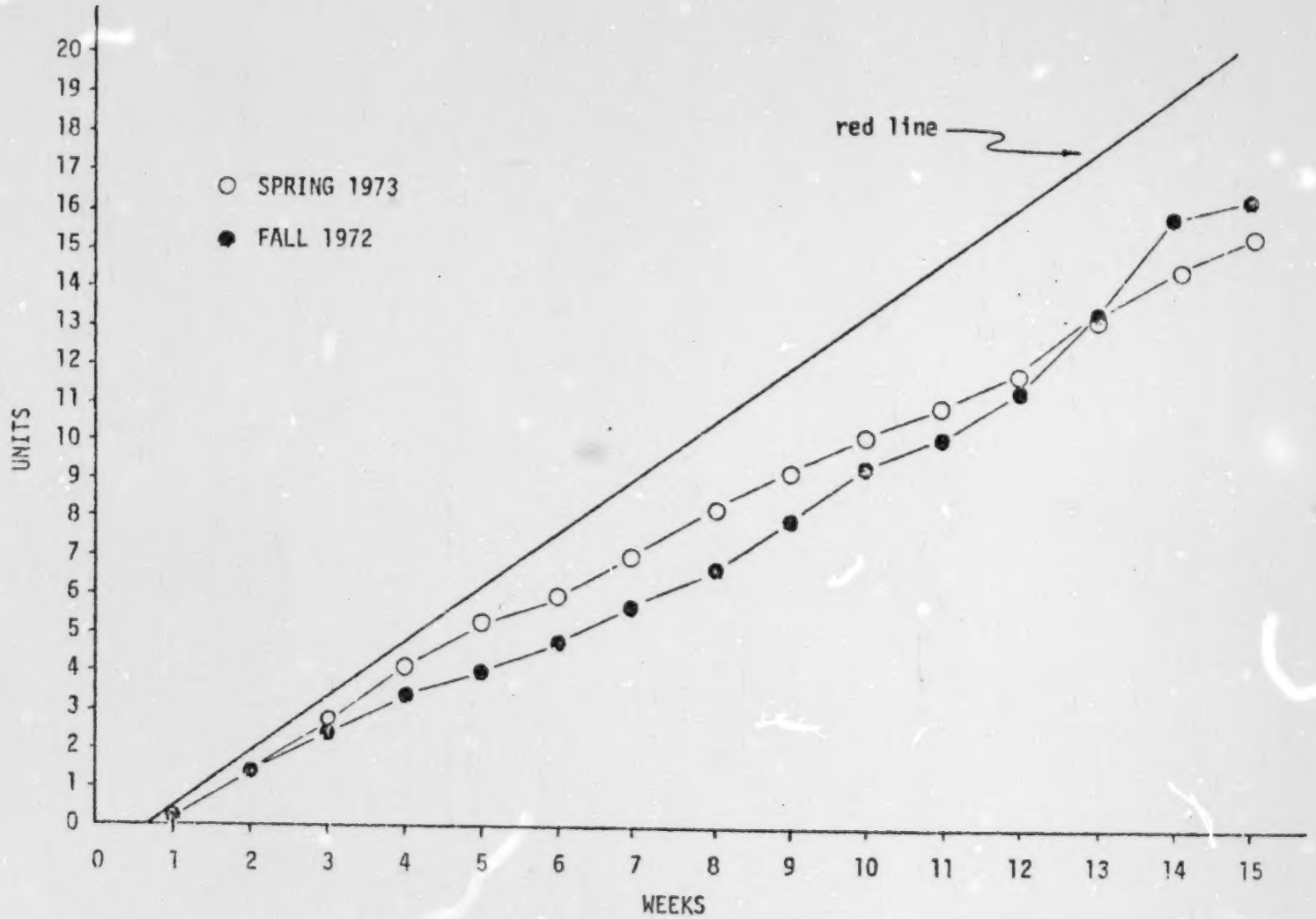


Figure 2. End of Semester Placement of Biology 101 Students.

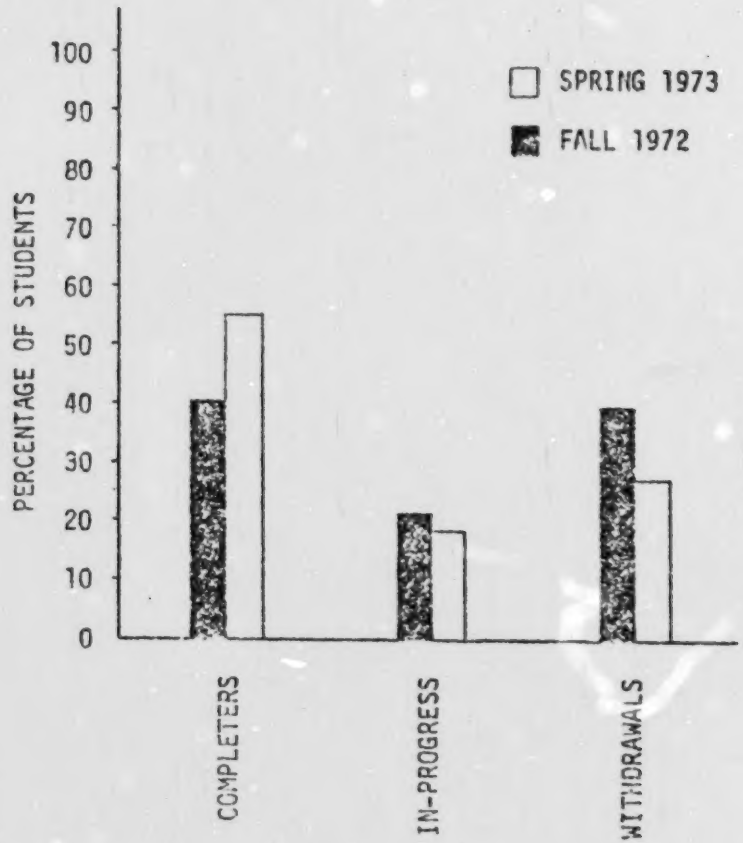


Figure 3. Average Progress Rate of Biology 101 Students Completing Course.

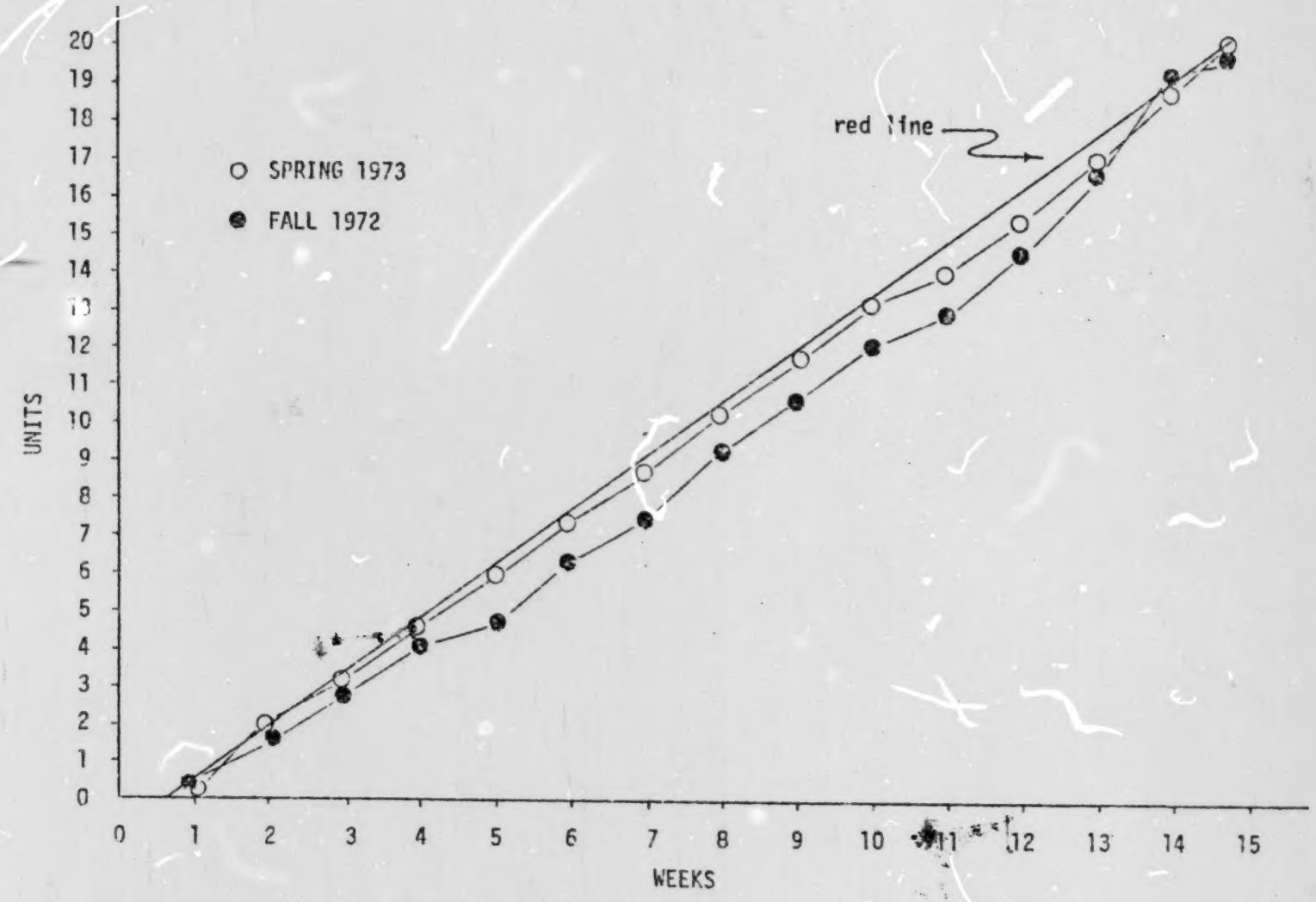


Figure 4. Average Progress Rate of In-Progress Biology 101 Students.

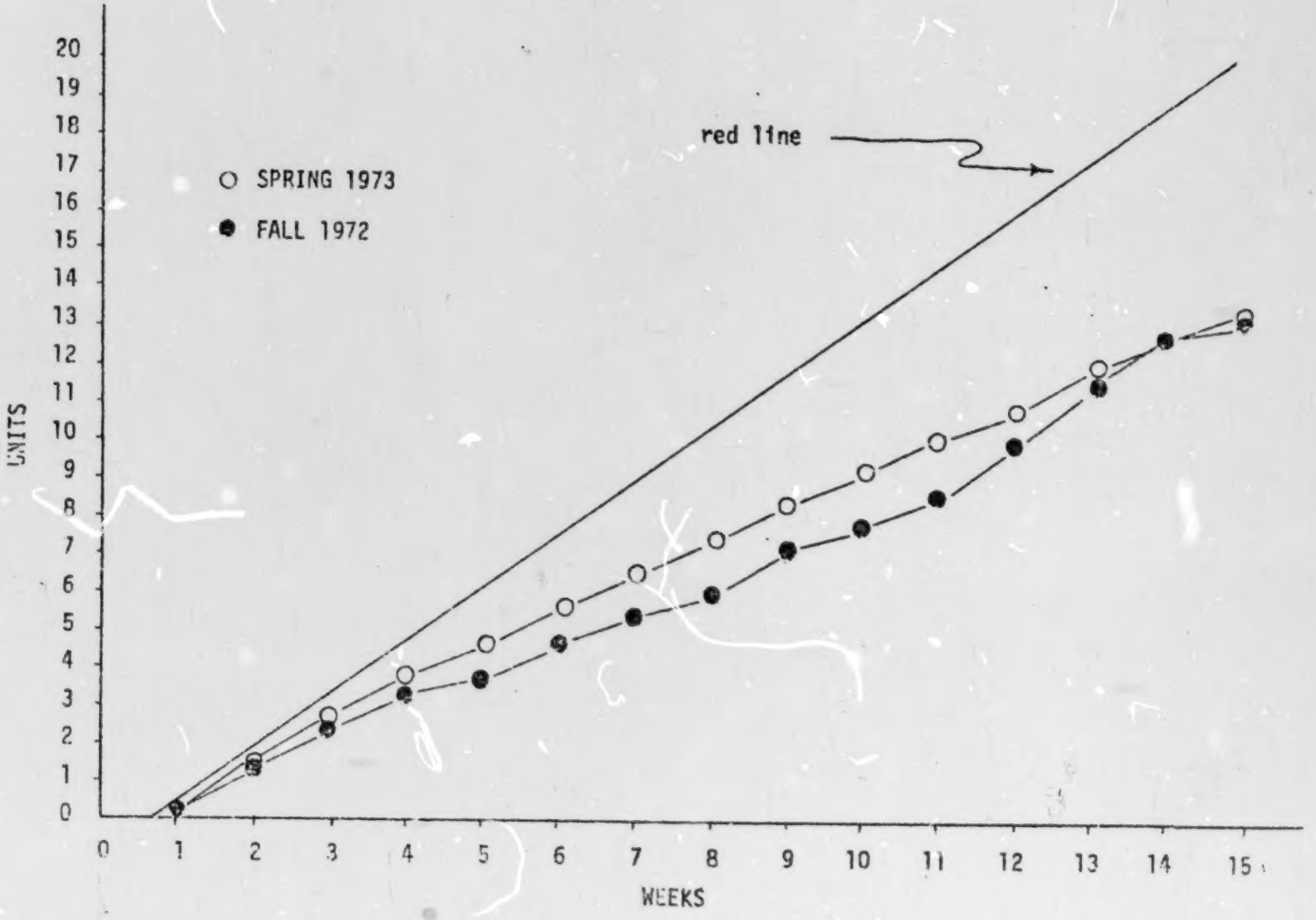


Figure 5. Average Progress Rate of Biology 101 Students Withdrawing from Course.

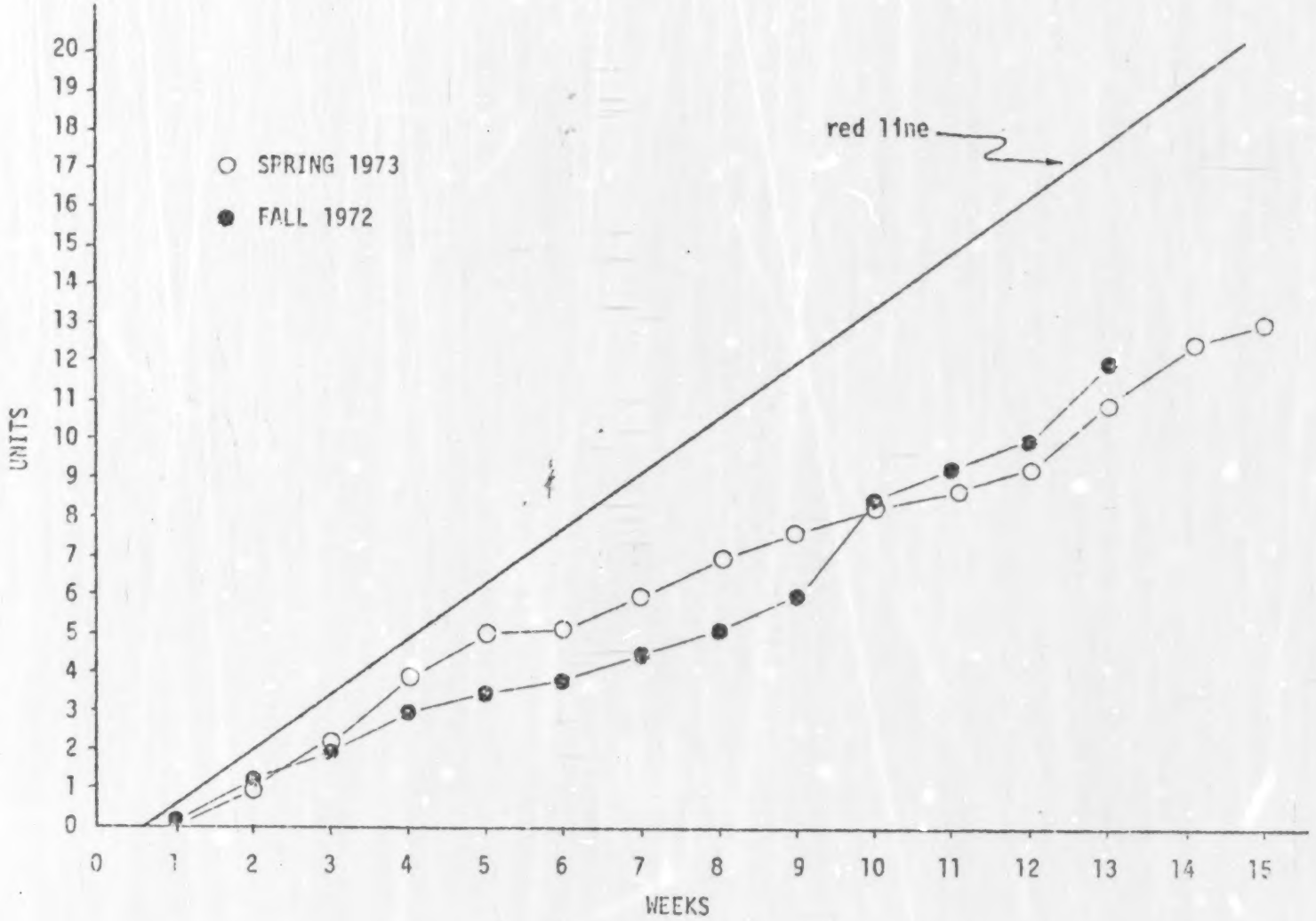


Figure 6. Comparison of Fall 1972 and Spring 1973 Grade Distributions in Biology 101.

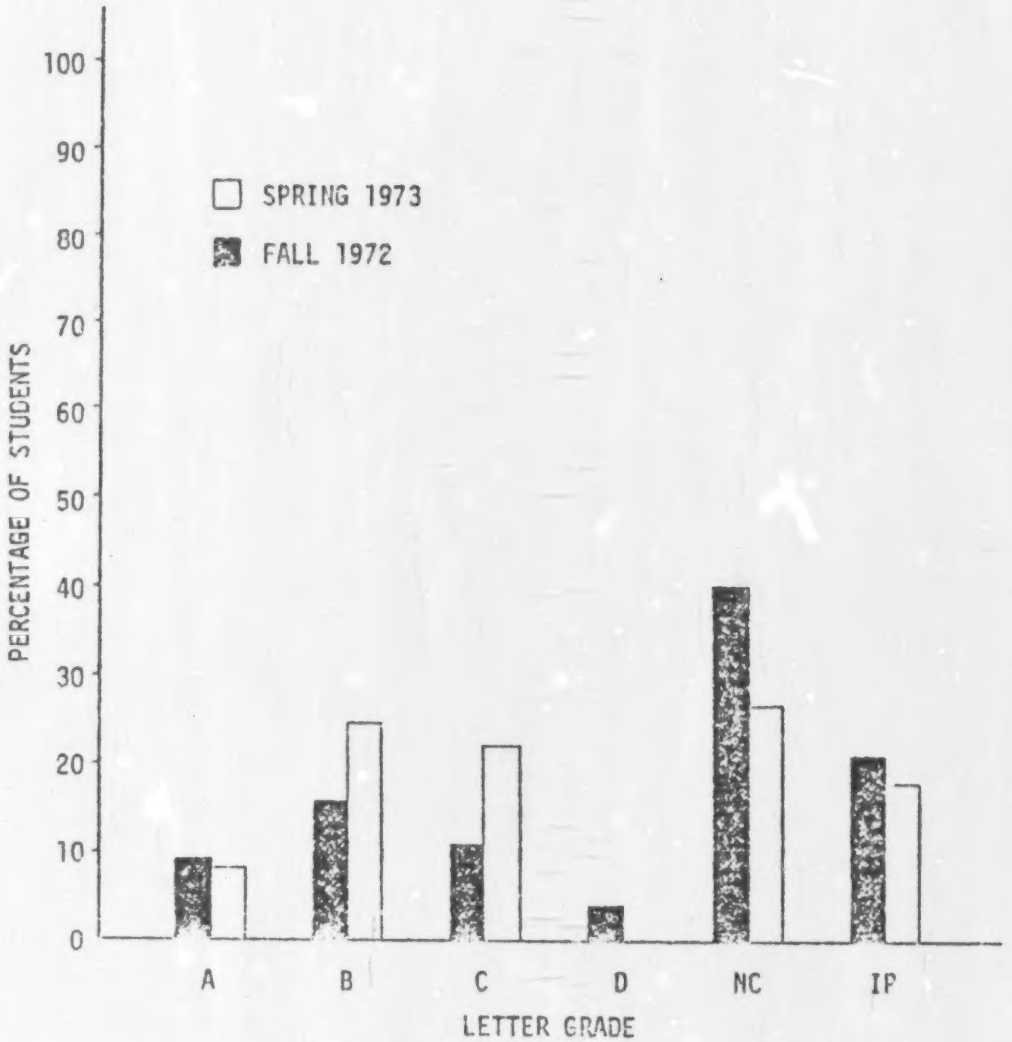


Figure 7. Comparison of Lecture (Fall 1970-Spring 1972) and PSI (Fall 1972-Spring 1973) Grade Distributions in Biology 101.

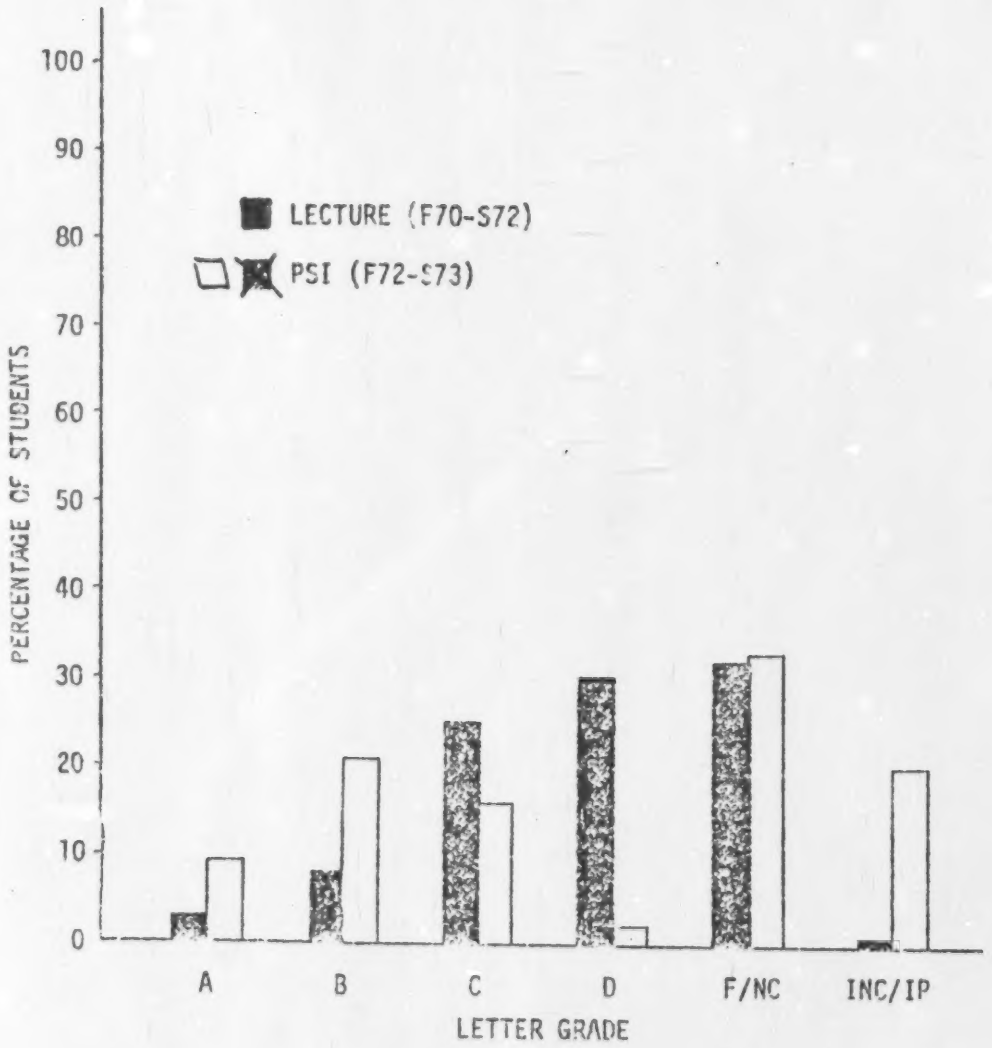


Figure 8. Average Daily Attendance in Biology 101 Each Week for Testing.

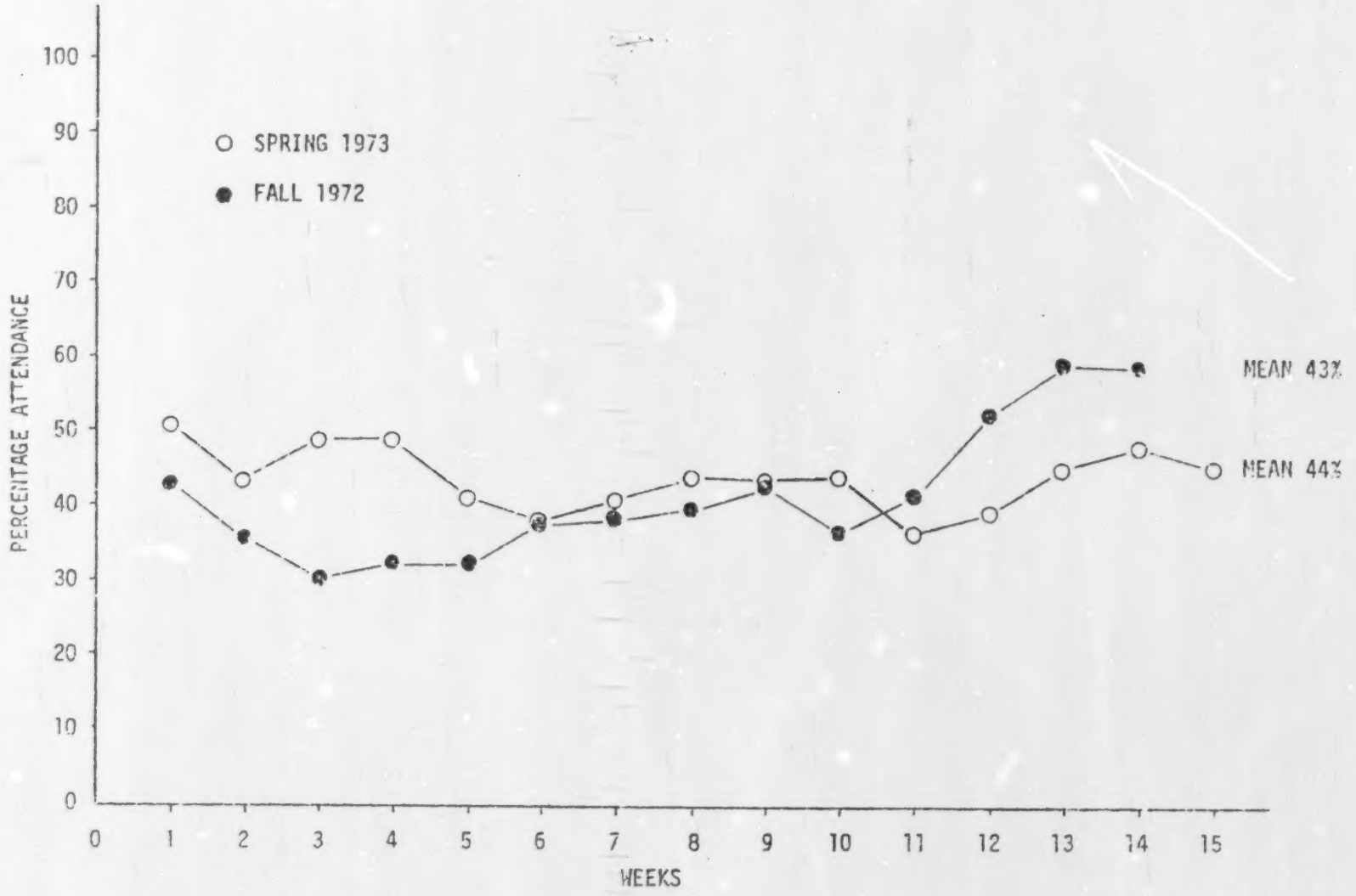


Figure 9. Comparison of Grade Distributions in Non-Laboratory (PSI) and Laboratory Portions of Biology 101 (Fall 1972-Spring 1973).

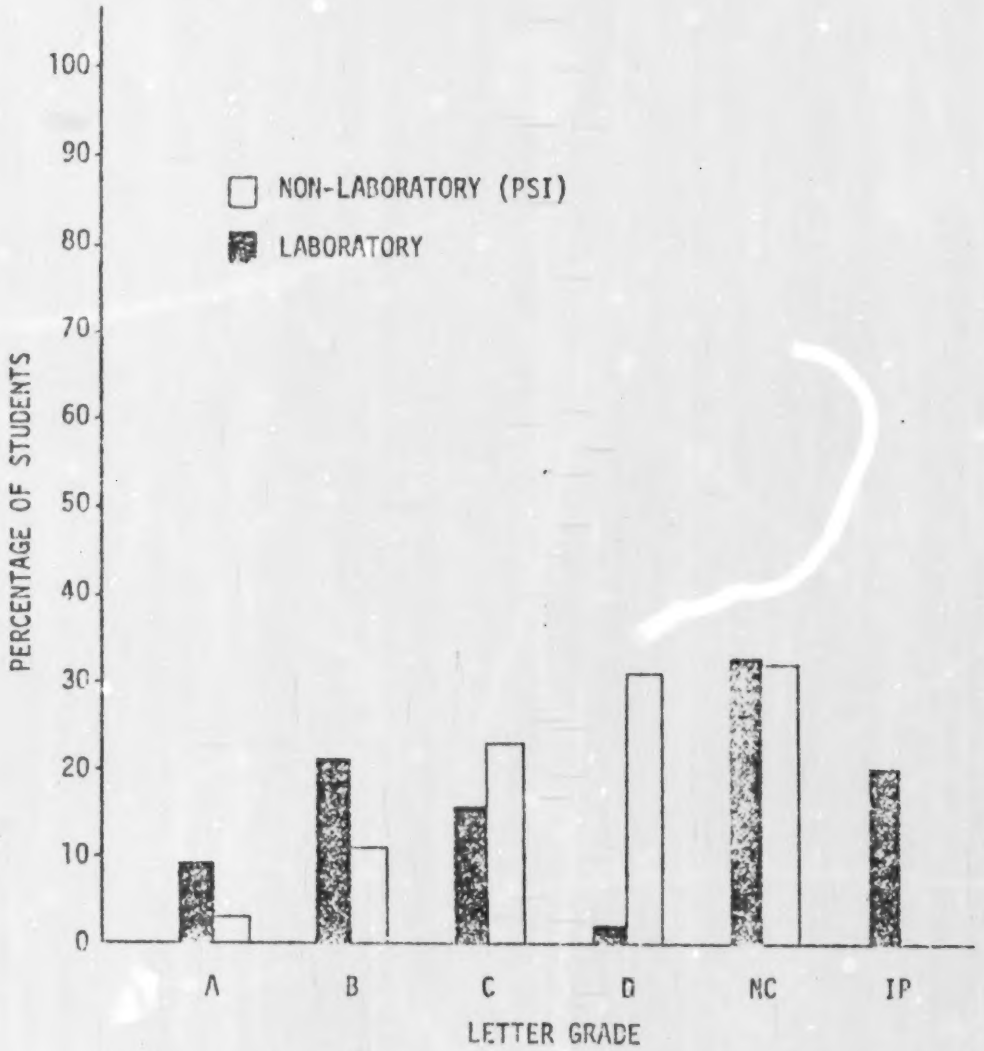


Figure 10. Relative Laboratory Grade Earned Compared with Non-Laboratory Grade.

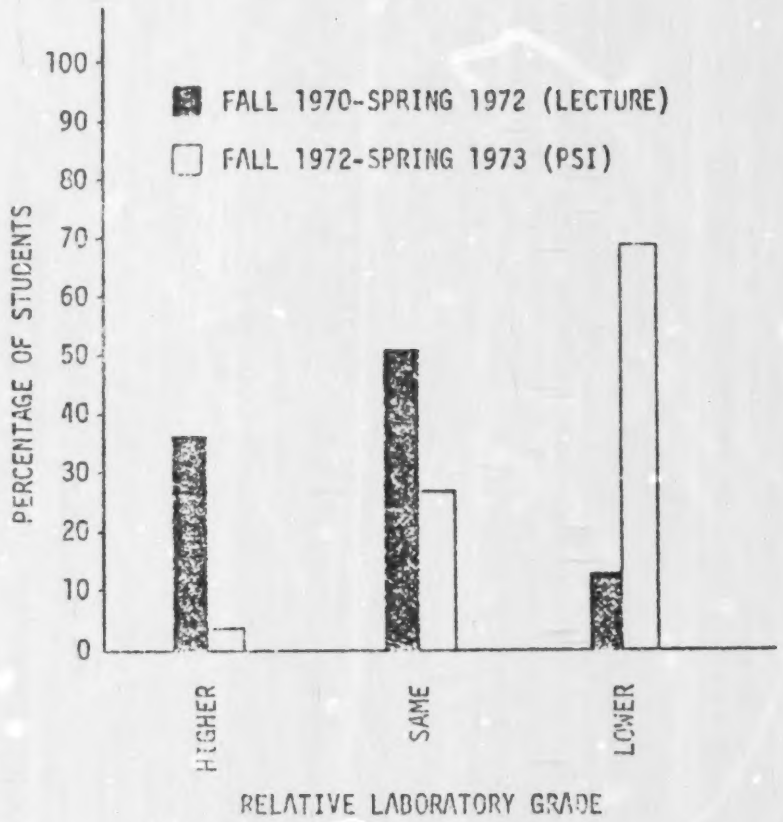
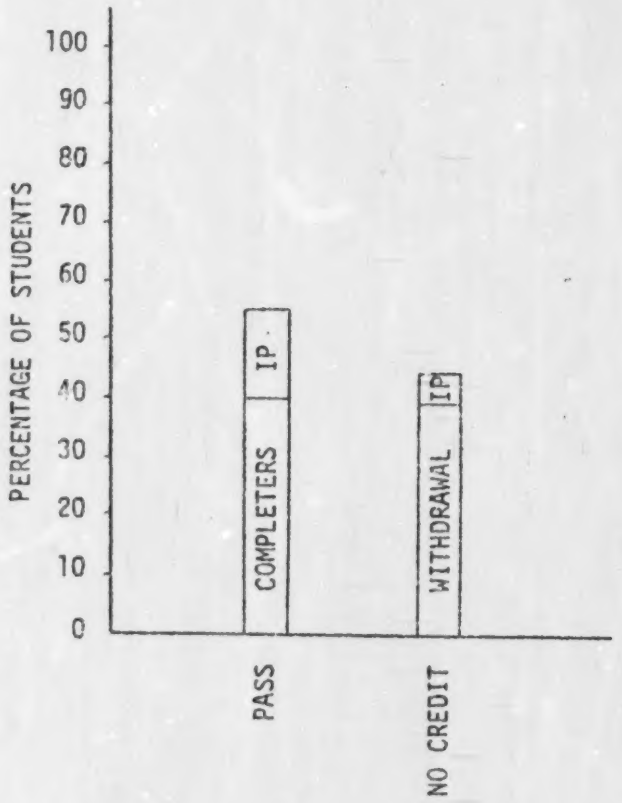


Figure 11. Eventual Placement of Fall 1972 Biology 101 Students.



APPENDIX

APPENDIX A

Biology 101 Course Prerequisites Through S73

1. Minimum of two years high school science with an average of 70% or higher.
2. Minimum of high school Algebra or DEV MAT 005 (Basic Concepts of Mathematics) concurrently.
3. DEV MAT 005 is only developmental course (DEV) to be taken concurrently.

APPENDIX B

Time Extension Policy for Biology 101, Effective F73

The Time-Extension Policy for PSI Courses (February 16, 1973) remains in effect. However, students not completing Biology 101 during the fall 1973 semester will only be able to utilize the Time-Extension Policy during Winterim 1974. Students not completing the course by the end of Winterim will receive an NC, and will be required to retake the course under standard "course repeat" regulations.

Winterim provides an ideal block of time immediately following the semester which is relatively free from other course demands. The Winterim course schedule of all in-progress students must be approved by Mr. Gainty.

The above policy will be reviewed at the end of January 1974. If results of the policy warrant, it will be expanded to include completion of the course by spring 1974 IP's during the first summer session.

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APPLIED STATISTICS

THE G STATISTIC: A Measure of Behavior Change

There is a classic remark, credited to Edwin Lee Thorndike, to the effect that "If anything exists, it exists in some quantity, and if it exists in some quantity, it can be measured." At ILS we feel that behavior change is our basic stock-in-trade, and that a convenient and meaningful method of quantifying behavior change is the G statistic, a gain-to-possible gain ratio (McGuigan, F. O. and Peters, R. W., 1965). The G statistic assumes parallel or equivalent forms of pre- and post-test scores with equal total possible scores for each. If PRE is the pre-test score, POST is the post-test score, and TOTAL is the maximum possible score, we compute:

$$G = \frac{\text{actual gain}}{\text{possible gain}} = \frac{\text{POST} - \text{PRE}}{\text{TOTAL} - \text{PRE}}$$

For example, if a student goes from 20% to 92% in pre - post testing, his gain score is calculated:

$$G = \frac{90\% - 20\%}{100\% - 20\%} = \frac{72}{80} = .90$$

As McGuigan (1967) points out, however:

> While this strategy, and the rationale for the statistic G still seems to be the most reasonable one, some members of the educational and publishing communities have been slow in accepting them . . .

To facilitate interpretation of G, McGuigan presents data of G for 37 programmed and 15 non-programmed courses, including courses at the college level. The following percentile table for G in the next column has been derived from McGuigan's data.

For example, in our current in-house retesting of our Psychology program, we are finding an average G of .82. This would place the behavior change attributable to the course at the 98th percentile compared with programmed courses, and at the 99th percentile compared with non-programmed courses. In fairness to the studies McGuigan cites, however, some of the data were collected as far back as 1961, when the state of the art in educational technology was still in its early evolving stages.

G	Percentile Programmed Courses	Percentile Non-Programmed Courses
00-05	1	1*
06	2	1*
07	2	1*
08	2	1*
09	2	1*
10	3	1*
11	3	1
12	4	1
13	4	2
14	5	3
15	5	3
16	6	4
17	6	5
18	7	5
19	8	6
20	8	7
21	9	9
22	10	11
23	11	13
24	11	15
25	12	17
26	13	19
27	14	21
28	15	23
29	15	25
30	16	27
31	18	29
32	19	32
33	20	35
34	22	37
35	23	40
36	24	43
37	26	45
38	27	48
39	28	51
40	30	53
41	32	56
42	34	59
43	35	61
44	37	64
45	39	67
46	41	69
47	43	72
48	45	75
49	47	77
50	49	80
51	51	80
52	54	80
53	56	80
54	58	80
55	61	80
56	63	80
57	66	80
58	68	80
59	71	80
60	73	80
61	75	82
62	76	84
63	78	86
64	79	88
65	81	90
66	83	92
67	84	94
68	86	95
69	88	98
70	89	99
71	90	99
72	91	99
73	92	99
74	93	99
76	94	99
77	95	99
78	96	99
79	97	99
80	97	99
81	98	99
82	98	99
83	98	99
84	98	99
85	99	99
86	99	99
87	99	99
88	99	99+
89	99	99+
90-99	99+	99+

At ILS we find G and the table above a useful index of what is significant behavior change. We periodically gather and update our "profile" of G statistics. We invite anyone with pre-post test results on ILS courses to submit them to help us update our G table to participate in developing tools for effective and meaningful assessment.

APPENDIX D

Biology 101 Prerequisite Effective F73

1. Minimum of two years high school science with an average of 70% or higher.
2. DEV RDG 010 (Basic Reading) not to be taken concurrently.